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Stokes

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(54) **OVEN APPLIANCE WITH CAVITY FIRE DETECTION**

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(51) **Int. Cl.**

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G08B 17/117	(2006.01)
G08B 29/18	(2006.01)
F24C 15/02	(2006.01)

(52) **U.S. Cl.**

CPC . ***G08B 17/06*** (2013.01); ***F24C 7/08*** (2013.01); ***G08B 17/117*** (2013.01); ***G08B 29/183*** (2013.01); *F24C 15/022* (2013.01)

(58) **Field of Classification Search**

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USPC 340/589, 514, 628, 632, 686.6; 700/299, 300

See application file for complete search history.

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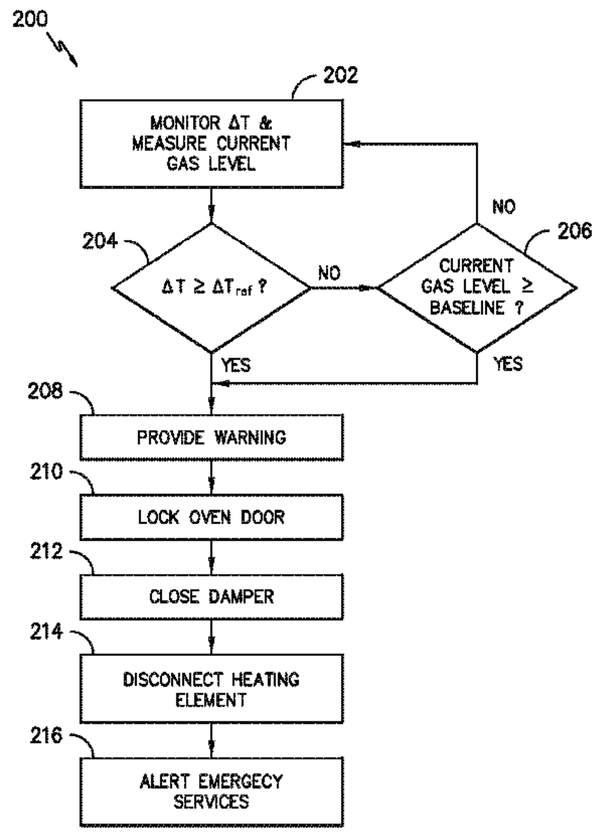
(57) **ABSTRACT**

An oven appliance with features for detecting and containing a fire and/or smoke within the cooking chamber of the oven appliance is provided. A method for operating an oven appliance to detect and contain a fire and/or smoke within the cooking chamber of the oven appliance is also provided.

17 Claims, 5 Drawing Sheets



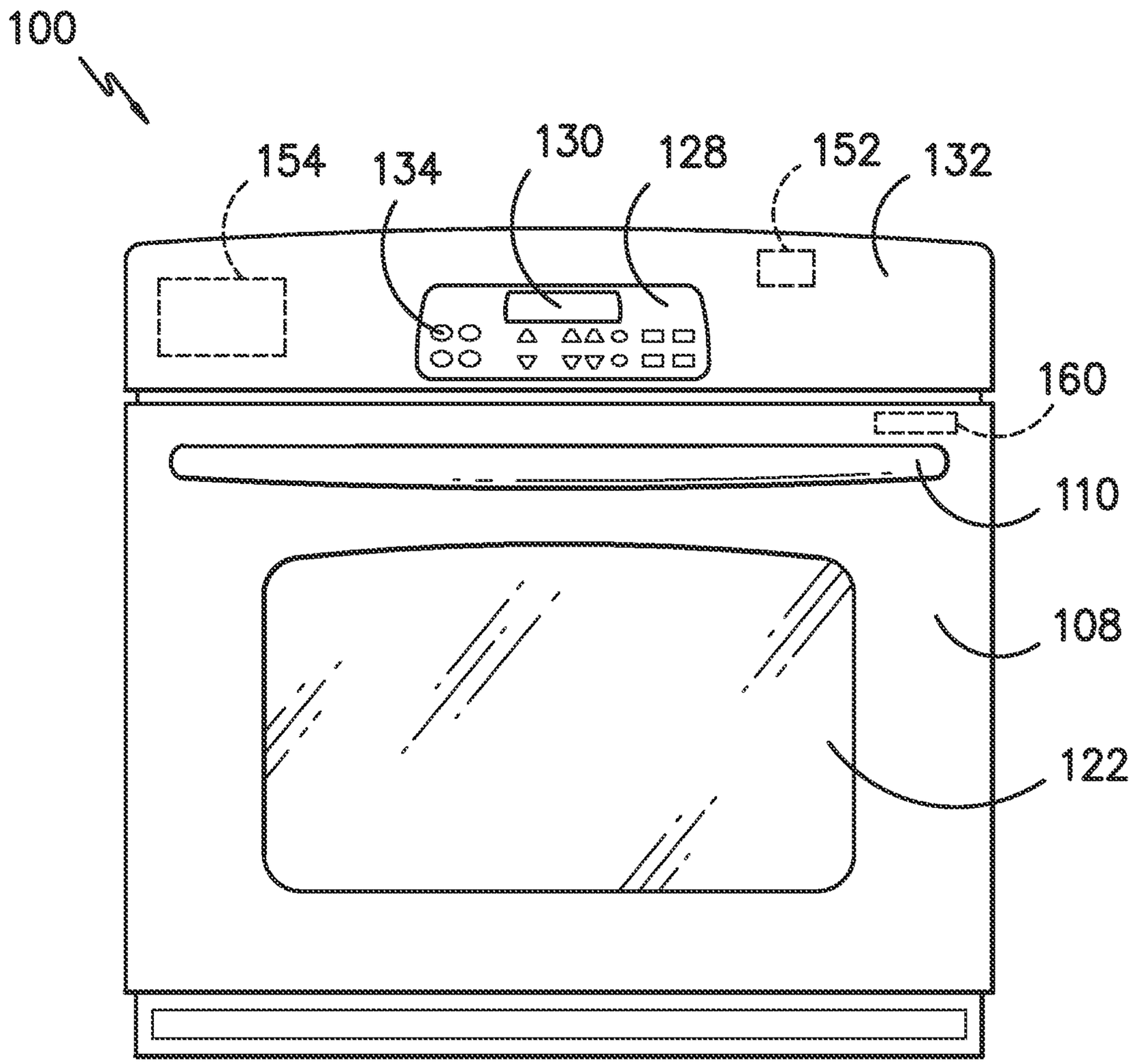
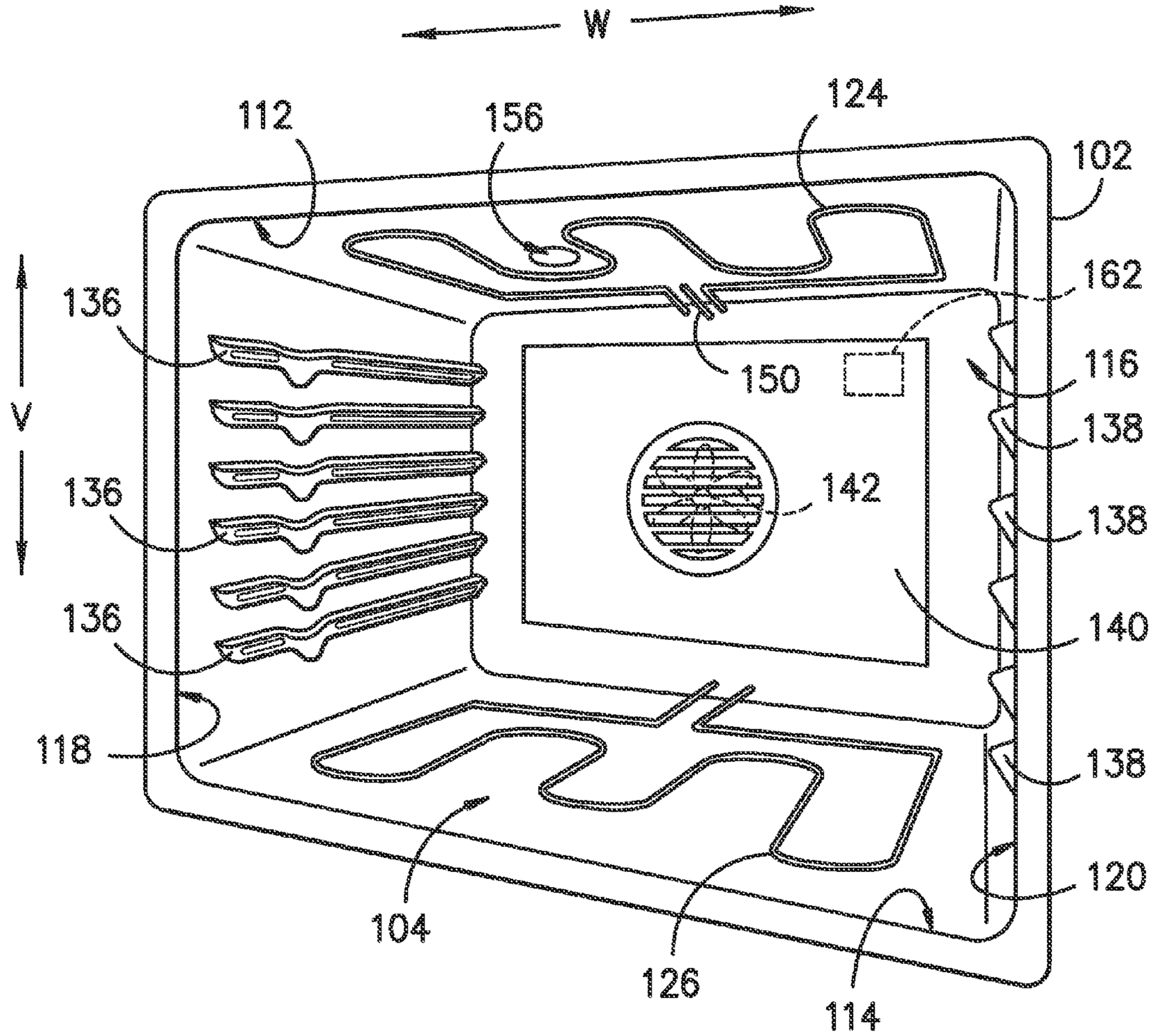


FIG. 1


W
V
112
156
124
102
162
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150
116
138
142
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138
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118
138
104
120
126
114

FIG. 2

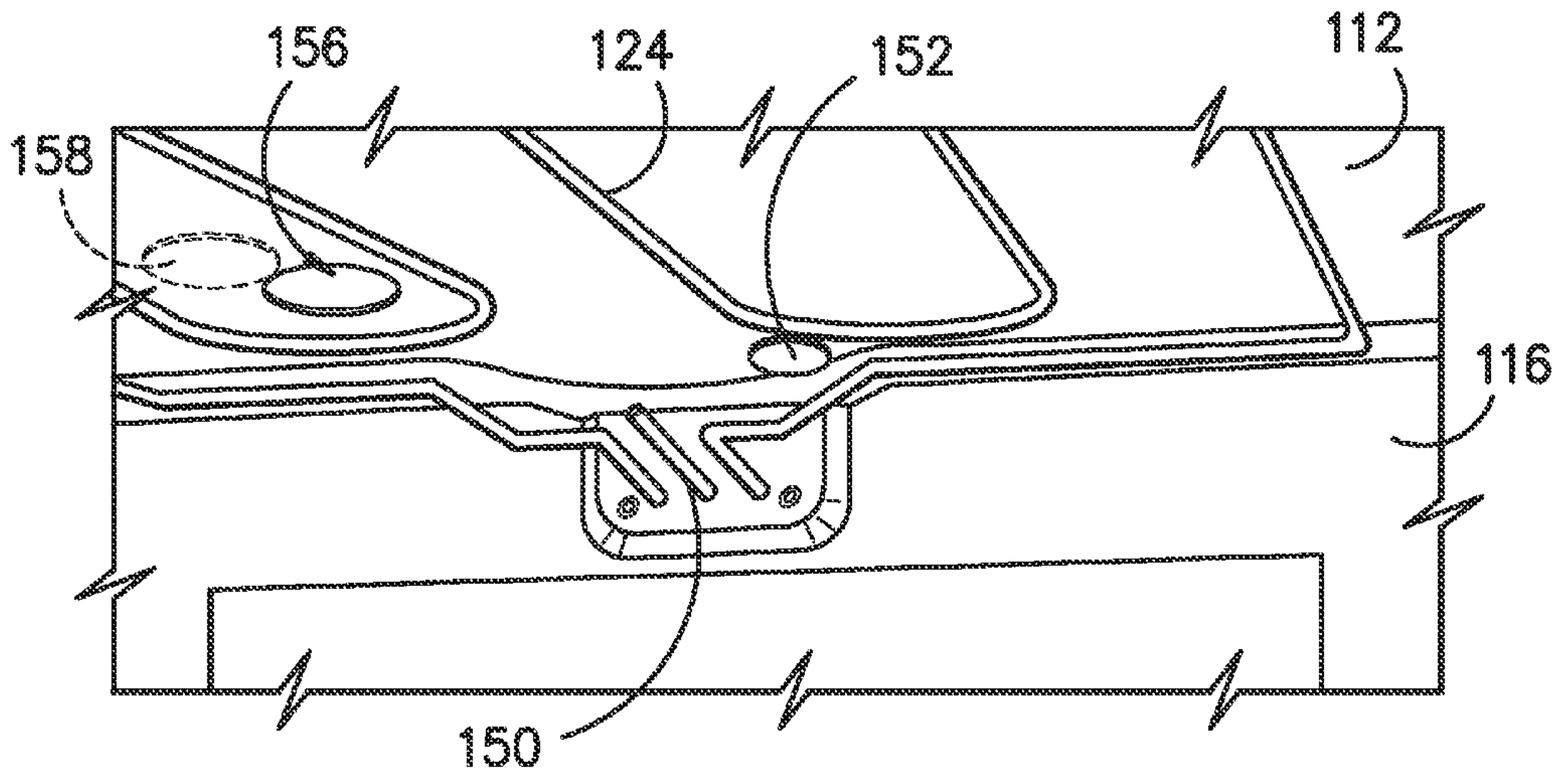


FIG. 3

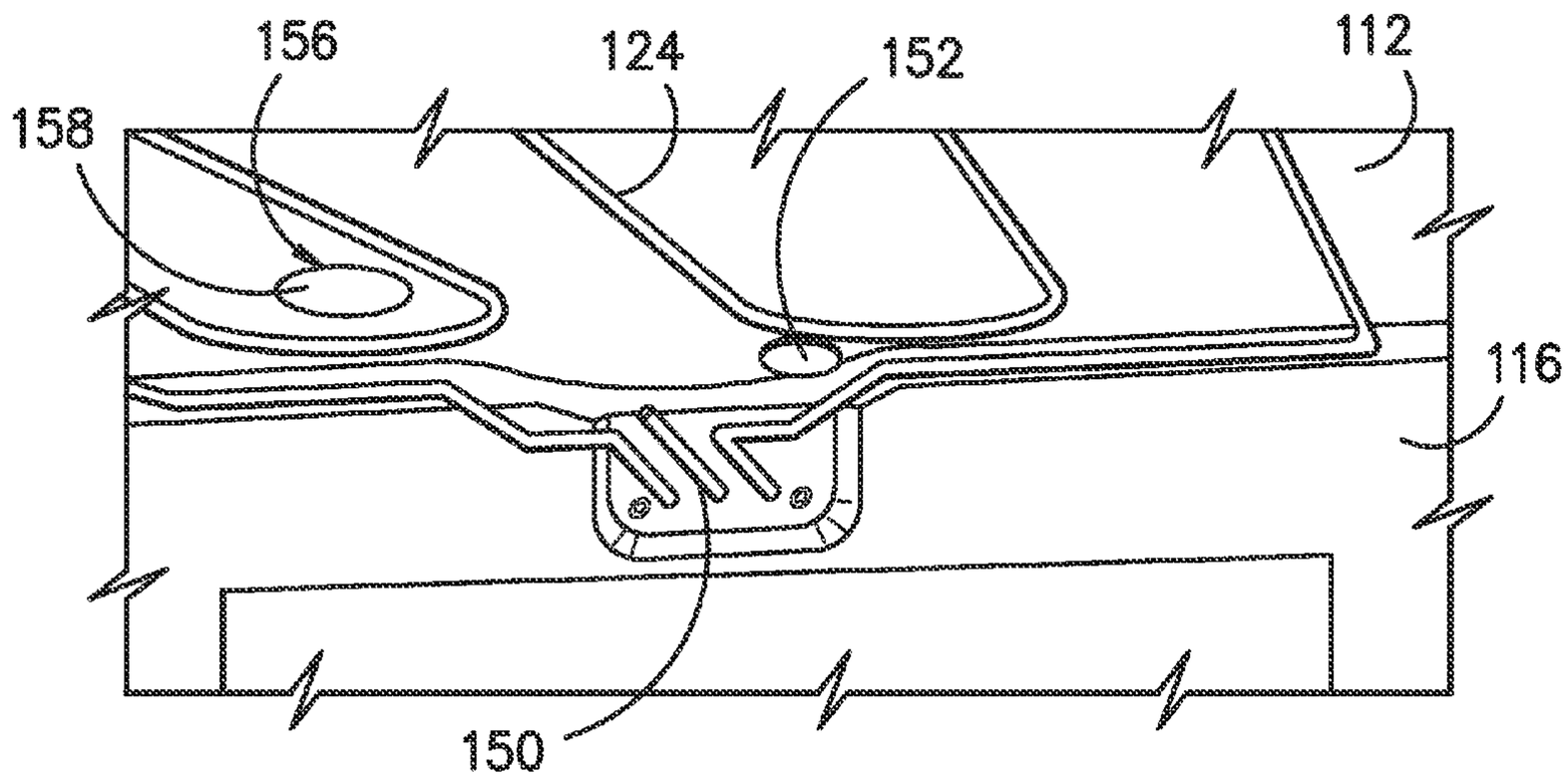


FIG. 4

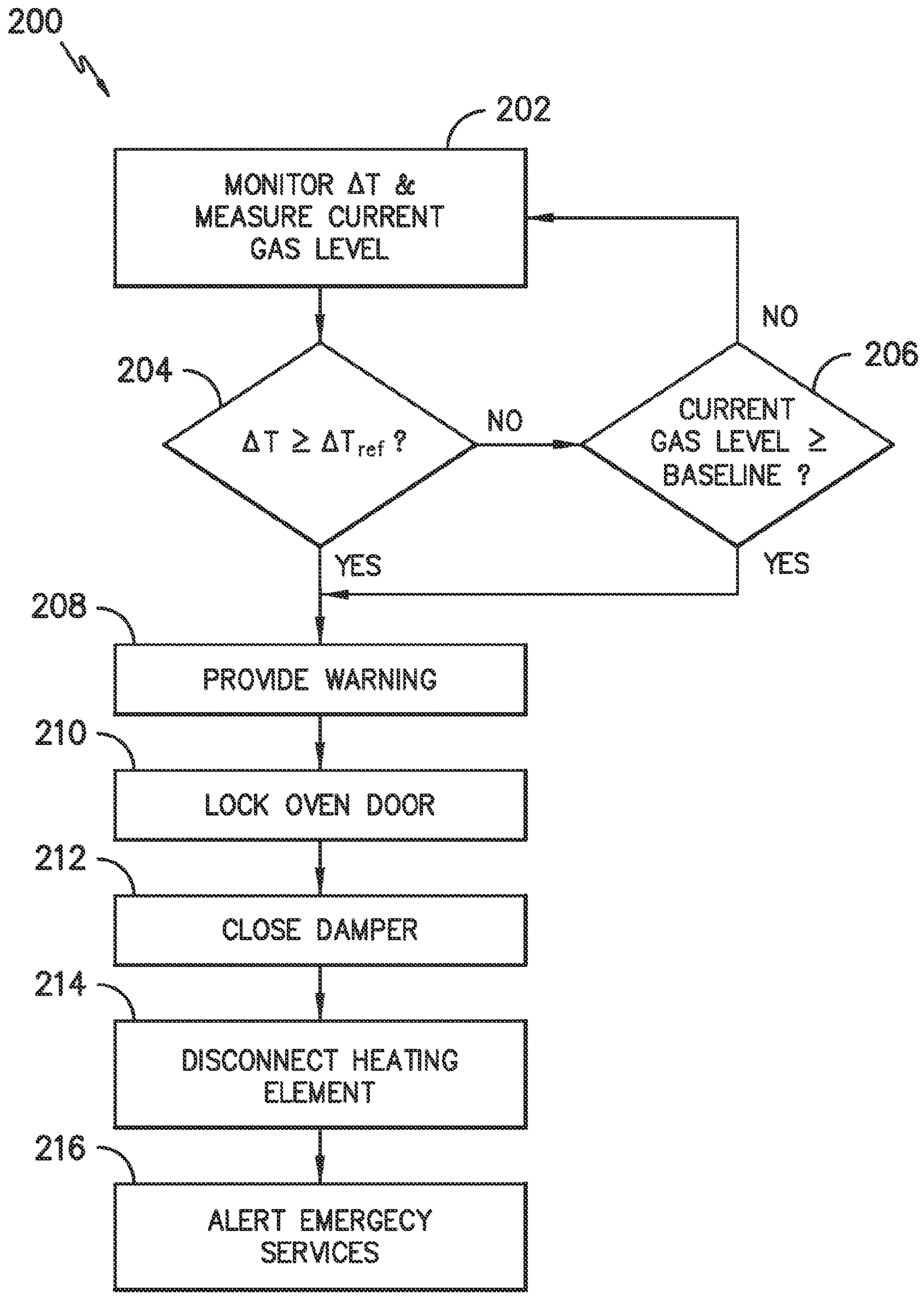
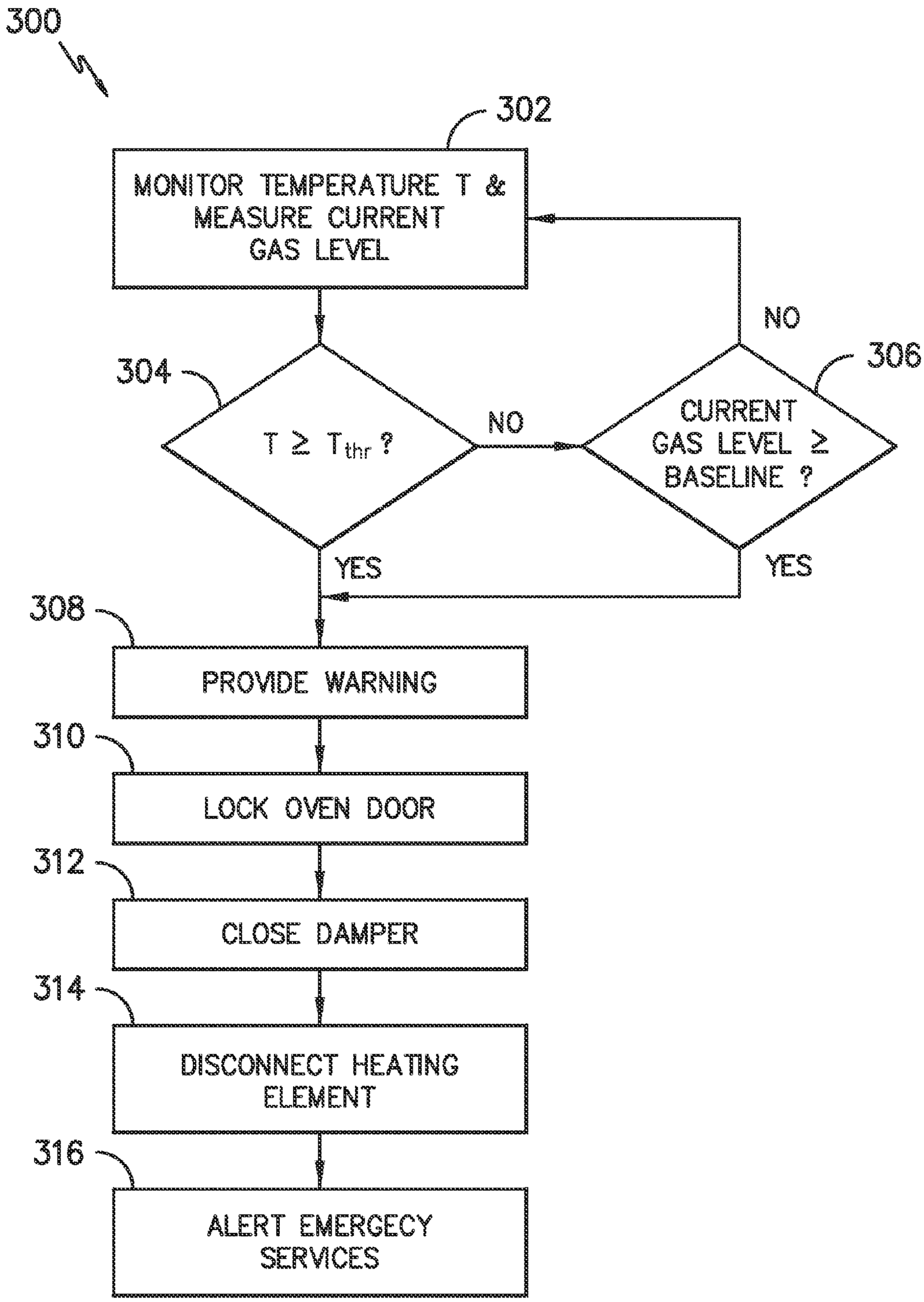

200
202
MONITOR ΔT & MEASURE CURRENT GAS LEVEL
204
ΔT ≥ ΔT ref ?
NO
206
CURRENT GAS LEVEL ≥ BASELINE ?
NO
YES
YES
208
PROVIDE WARNING
210
LOCK OVEN DOOR
212
CLOSE DAMPER
214
DISCONNECT HEATING ELEMENT
216
ALERT EMERGECY SERVICES

FIG. 5


300
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MONITOR TEMPERATURE T & MEASURE CURRENT GAS LEVEL
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CURRENT GAS LEVEL ≥ BASELINE ?
NO
YES
YES
308
PROVIDE WARNING
310
LOCK OVEN DOOR
312
CLOSE DAMPER
314
DISCONNECT HEATING ELEMENT
316
ALERT EMERGECY SERVICES

FIG. 6

OVEN APPLIANCE WITH CAVITY FIRE DETECTION

FIELD OF THE INVENTION

The subject matter of the present disclosure relates generally to an oven appliance with features for detecting and containing a fire and/or smoke within the oven cavity.

BACKGROUND OF THE INVENTION

Oven appliances generally include a cabinet that defines a cooking chamber for baking or broiling food items therein. Oven appliances also generally include a self-cleaning feature for cleaning the cooking chamber. To heat the cooking chamber for baking, broiling, or self-cleaning, oven appliances include one or more heating elements, such as gas burners or electric resistance elements, which may be positioned at a top and/or bottom portion of the cooking chamber. During self-cleaning, particularly high temperatures are generated in the cooking chamber. Additionally, during baking and broiling operations, food items may be overcooked or may char or burn if a user is inattentive. Under certain conditions, smoke and/or a fire may even occur within the cooking chamber. However, the user may be unaware that such conditions have developed, and the user could be exposed to dangers posed by smoke and/or fire if the user is unaware that such conditions exist in the cooking chamber of the oven appliance. For example, the user could open the door of the oven appliance and thereby allow smoke to escape or provide fresh air that could fuel a fire.

Accordingly, an oven appliance with features for detecting a fire and/or smoke within the cooking chamber would be useful. Further, an oven appliance having features for containing a fire and/or smoke within the cooking chamber would be beneficial. Moreover, a method for using the features of an oven appliance to detect and contain a fire and/or smoke within the cooking chamber of the oven appliance also would be useful.

BRIEF DESCRIPTION OF THE INVENTION

The present invention provides an oven appliance with features for detecting and containing a fire and/or smoke within the cooking chamber of the oven appliance. A method for operating an oven appliance to detect and contain a fire and/or smoke within the cooking chamber of the oven appliance is also provided. Additional aspects and advantages of the invention will be set forth in part in the following description, may be apparent from the description, or may be learned through practice of the invention.

In a first exemplary embodiment, an oven appliance includes a cabinet defining an opening at a front portion of the cabinet. The cabinet also defines a cooking chamber configured for receipt of food items for cooking. The cooking chamber comprises a top wall, a bottom wall, a back wall, and opposing side walls. The oven appliance also includes a door mounted to the cabinet at the opening of the cabinet; the door is selectively adjustable between an open position and a closed position to permit selective access to the cooking chamber through the opening of the cabinet. Further, the oven appliance includes a heating element configured to heat the cooking chamber, and the heating element has an energy source. The oven appliance also includes a vent for exhausting fumes and gases generated during cooking from the cooking chamber; a temperature sensor; and a controller. The controller is configured for monitoring a rate of temperature change ΔT within the cooking chamber; comparing the rate of temperature change ΔT within the cooking chamber to a reference rate of temperature change ΔT_{ref} to determine if there is a fire in the cooking chamber and, if so, then providing a warning to a user of the oven appliance and containing the fire within the cooking chamber.

In a second exemplary embodiment, an oven appliance includes a cabinet defining an opening at a front portion of the cabinet. The cabinet also defines a cooking chamber configured for receipt of food items for cooking. The cooking chamber comprises a top wall, a bottom wall, a back wall, and opposing side walls. The oven appliance also includes a door mounted to the cabinet at the opening of the cabinet; the door is selectively adjustable between an open position and a closed position to permit selective access to the cooking chamber through the opening of the cabinet. Further, the oven appliance includes a heating element configured to heat the cooking chamber, and the heating element has an energy source. The oven appliance also includes a vent for exhausting fumes and gases generated during cooking from the cooking chamber; a temperature sensor; and a controller. The controller is configured for monitoring a current gas level; comparing the current gas level to a reference gas level to determine if there is a fire in the cooking chamber and, if so, then providing a warning to a user of the oven appliance and containing the fire within the cooking chamber.

In a third exemplary embodiment, a method is provided. The method includes the steps of monitoring a rate of temperature change ΔT within a cooking chamber of the oven appliance; comparing the rate of temperature change ΔT within the cooking chamber to a reference rate of temperature change ΔT_{ref} to determine if there is a fire in the cooking chamber and, if so, then providing a warning to a user of the oven appliance and containing the fire within the cooking chamber.

These and other features, aspects, and advantages of the present invention will become better understood with reference to the following description and appended claims. The accompanying drawings, which are incorporated in and constitute a part of this specification, illustrate embodiments of the invention and, together with the description, serve to explain the principles of the invention.

BRIEF DESCRIPTION OF THE DRAWINGS

A full and enabling disclosure of the present invention, including the best mode thereof, directed to one of ordinary skill in the art, is set forth in the specification, which makes reference to the appended figures, in which:

FIG. **1** provides a front view of an exemplary embodiment of an oven appliance of the present subject matter.

FIG. **2** is a perspective view of a cooking chamber of an exemplary embodiment of an oven appliance of the present subject matter.

FIG. **3** is a perspective view of a top portion of a cooking chamber of an exemplary embodiment of an oven appliance of the present subject matter, with a damper shown in the open position.

FIG. **4** is the perspective view of the top portion of a cooking chamber of the exemplary embodiment shown in FIG. **3**, except with the damper shown in the closed position.

FIG. **5** illustrates a method of operating an oven appliance in accordance with one exemplary embodiment of the present subject matter.

FIG. **6** illustrates a method of operating an oven appliance in accordance with another exemplary embodiment of the present subject matter.

DETAILED DESCRIPTION OF THE INVENTION

Reference now will be made in detail to embodiments of the invention, one or more examples of which are illustrated in the drawings. Each example is provided by way of explanation of the invention, not limitation of the invention. In fact, it will be apparent to those skilled in the art that various modifications and variations can be made in the present invention without departing from the scope or spirit of the invention. For instance, features illustrated or described as part of one embodiment can be used with another embodiment to yield a still further embodiment. Thus, it is intended that the present invention covers such modifications and variations as come within the scope of the appended claims and their equivalents.

Referring to FIGS. **1** and **2**, for this exemplary embodiment, oven appliance **100** includes an insulated cabinet **102** with an interior cooking chamber **104** defined by a top wall **112**, a bottom wall **114**, a back wall **116**, and opposing side walls **118**, **120**. Cooking chamber **104** is configured for the receipt of one or more food items to be cooked. Oven appliance **100** includes a door **108** pivotally mounted, e.g., with one or more hinges (not shown), to cabinet **102** to permit selective access to cooking chamber **104**. A handle **110** is mounted to door **108** and assists a user with opening and closing door **108**. For example, a user can pull on handle **110** to open or close door **108** and access cooking chamber **104**. Further, door **108** includes a door lock **160**, which may be engaged to prevent access to cooking chamber **104** through door **108**, e.g., during a self-cleaning operation of oven appliance **100**.

Oven appliance **100** can include a seal (not shown) between door **108** and cabinet **102** that assists with maintaining heat and cooking fumes within cooking chamber **104** when door **108** is closed as shown in FIG. **1**. Multiple parallel glass panes **122** provide for viewing the contents of cooking chamber **104** when door **108** is closed and assist with insulating cooking chamber **104**. A baking rack (not shown) for the receipt of food items or utensils containing food items may be slidably received onto embossed ribs or sliding rails **136**, **138** such that the rack may be conveniently moved into and out of cooking chamber **104** when door **108** is open.

A heating element at the top, bottom, or both of cooking chamber **104** provides heat from an energy source to cooking chamber **104** for cooking. Such heating element(s) can be gas, electric, microwave, or a combination thereof. For example, in the embodiment shown in FIG. **2**, oven appliance **100** includes a top heating element **124** and a bottom heating element **126**, which are connected to an energy source **162**.

Oven appliance **100** also may include a convection fan **142** positioned adjacent back wall **116** to provide air movement in cooking chamber **104** during, e.g., convection modes of oven appliance **100**. As shown in FIG. **2**, a panel **140** protects fan **142**. Other configurations of convection fan **142** may be used as well.

Referring now to FIG. **1**, oven appliance **100** includes a user interface **128** having a display **130** positioned on an interface panel **132** and having a variety of controls **134**. Interface **128** allows the user to select various options for the operation of oven **100** including, e.g., temperature, time, and/or various cooking and cleaning cycles. Operation of oven appliance **100** can be regulated by a controller **154** that is operatively coupled, i.e., in communication with, user interface **128**, heating elements **124**, **126**, door lock **160**, and/or other components of oven **100**. For example, in response to user manipulation of the user interface **128**, controller **154** can operate the heating element(s). The controller can receive measurements from a temperature sensor **150** placed in cooking chamber **104** and, e.g., provide a temperature indication to the user with display **130**. Alternatively, controller **154** can be enabled with wireless communication components (e.g., "Wi-Fi") to provide such temperature indication to the user through another wireless communication enabled device such as, e.g., a cellular phone, tablet computer, or the like. Other forms of communication may be included as well including e.g., a wired connection. Controller **154** can also be provided with other features as will be further described herein.

Controller **154** may include a memory and one or more processing devices such as microprocessors, CPUs, or the like, such as general or special purpose microprocessors operable to execute programming instructions or micro-control code associated with operation of oven appliance **100**. The memory may represent random access memory such as DRAM or read only memory such as ROM or FLASH. In one embodiment, the processor executes programming instructions stored in memory. The memory may be a separate component from the processor or may be included onboard within the processor.

Controller **154** may be positioned in a variety of locations throughout oven appliance **100**. In the illustrated embodiment, controller **154** is located next to user interface **128** within interface panel **132**. In other embodiments, controller **154** may be located under or over user interface **128** or otherwise within interface panel **132**, or controller **154** may be located at any other appropriate location with respect to oven appliance **100**. In the embodiment shown in FIG. **1**, input/output ("I/O") signals are routed between controller **154** and various operational components of oven appliance **100** such as heating elements **124**, **126**, controls **134**, display **130**, door lock **160**, temperature sensor **150**, alarms, and/or other components as may be provided. In one embodiment, the user interface **128** may represent a general purpose I/O ("GPIO") device or functional block.

Although shown with touch type controls **134**, it should be understood that controls **134** and the configuration of oven appliance **100** shown in FIG. **1** is provided by way of example only. More specifically, user interface **128** may include various input components, such as one or more of a variety of electrical, mechanical, or electro-mechanical input devices including rotary dials, push buttons, and touch pads. The user interface **128** may include other display components, such as a digital or analog display device designed to provide operational feedback to a user. User interface **128** may be in communication with controller **154** via one or more signal lines or shared communication busses.

While oven **100** is shown as a wall oven, the present invention could also be used with other cooking appliances such as, e.g., a stand-alone oven, an oven with a stove-top, or other configurations of such ovens.

Referring now to FIGS. **3** and **4**, an exemplary embodiment of oven appliance **100** is shown with a vent **156** in top wall **112**. Vent **156** allows fumes and gases generated during cooking to exhaust from cooking chamber **104**. Oven appliance **100** also includes a damper **158** in operative communication with controller **154**. Damper **158** is positioned such that, when controller **154** selectively operates damper **158**, damper **158** opens vent **156** as shown in FIG. **3** or closes vent **156** as shown in FIG. **4**. As illustrated in FIGS. **3** and **4**, vent **156** may be configured as an opening in top wall **112**; in alternative

embodiments, more than one vent may be used and each vent may have an associated damper. Alternatively, one damper may be configured to close more than one vent. In still other embodiments, the one or more vents may be positioned at other locations in cooking chamber **104**.

As illustrated, temperature sensor **150** may be located adjacent top wall **112**. In alternative embodiments, temperature sensor **150** may be positioned in another location within cooking chamber **104**. In still other embodiments, oven appliance **100** may include more than one temperature sensor. Temperature sensor **150** may be a resistive temperature device (RTD) or any other suitable sensor.

In addition to temperature sensor **150**, oven appliance **100** may include a gas sensor **152**. Gas sensor **152** measures the level of a gas or several gases, such as CO, CO_2, or the like, in cooking chamber **104**. In certain embodiments, gas sensor **152** is positioned in cooking chamber **104**, as shown in FIGS. **3** and **4**. In other embodiments, gas sensor **152** may be positioned outside cooking chamber **104**, as shown in FIG. **1**. Gas sensor **152** may be positioned in other locations as well, and certain embodiments may utilize more than one gas sensor positioned at various locations of oven appliance **100**. Gas sensor **152** may be a metal oxide semiconductor (MOS) sensor array or any other suitable sensor.

During the operation of oven appliance **100**, food items placed in cooking chamber **104** for cooking or food items that have fallen onto bottom wall **114** of cooking chamber **104** may burn or overcook, or cooking chamber **104** may become overheated, which could lead to a fire and/or smoke in cooking chamber **104**. Thus, oven appliance **100** may include features for detecting and containing and/or extinguishing fire and smoke within cooking chamber **104**.

For example, temperature sensor **150** may be in communication with controller **154**, and temperature values detected by temperature sensor **150** may be used by controller **154** to determine the rate of temperature change ΔT in cooking chamber **104**. If the rate of temperature change ΔT reaches at least a reference rate of temperature change ΔT_{ref}, controller **154** may thereby detect a fire or other potentially harmful thermal event in cooking chamber **104** and implement measures to contain and/or extinguish the fire and protect a user of the oven appliance from the thermal event, as further described below. In other embodiments, controller **154** may compare a current temperature T measured by temperature sensor **150** to a threshold temperature T_{thr} to determine if there is a fire or other potentially harmful thermal event within cooking chamber **104**. That is, if the current temperature T reaches at least the threshold temperature T_{thr}, controller **154** may thereby detect a fire or other thermal event in cooking chamber **104** and implement measures to contain and/or extinguish the fire and protect a user of the oven appliance from the thermal event. The reference rate of temperature change ΔT_{ref} and the threshold temperature T_{thr} may be stored in controller **154** or any other suitable device.

As a further example, gas sensor **152** may be in communication with controller **154**, and gas levels detected by gas sensor **152** may be used by controller **154** to monitor cooking chamber **104**. If the current gas level reaches at least a baseline gas level, controller **154** may thereby determine that a fire or other potentially harmful event within cooking chamber **104**. Controller **154** may then implement measures to contain and/or extinguish the fire and protect a user of the oven appliance from the event, as further described below. The baseline gas level may be the gas level determined when oven appliance **100** is first assembled or installed, and in certain embodiments, the baseline gas level may be determined after, e.g., each self-cleaning operation of oven appliance **100**. The baseline gas level may be stored in controller **154** or any other suitable device.

FIG. **5** illustrates one exemplary method **200** for operating oven appliance **100**. The exemplary method includes step **202** of monitoring the rate of temperature change ΔT in cooking chamber **104** and measuring the current gas level. At step **204**, the rate of temperature change ΔT is compared to the reference rate of temperature change ΔT_{ref}. If the rate of temperature change ΔT has not reached at least the reference rate of temperature change ΔT_{ref}, the method proceeds to step **206**, where the current gas level is compared to the baseline gas level. If the current gas level has not reached at least the baseline gas level, the method returns to step **202**. However, if at step **204** the rate of temperature change ΔT has reached at least the reference rate of temperature change ΔT_{ref}, or if at step **206** the current gas level has reached at least the baseline gas level, the method proceeds to step **208**, implementing measures to contain and/or extinguish the fire and protect the user of the oven appliance. The order of steps **204** and **206** can be changed or even operated simultaneously.

At step **208**, a warning is provided to a user of oven appliance **100** that there is a fire or other potentially harmful event, such as, e.g., very high temperatures or smoke, in cooking chamber **104**. The warning may be any audible and/or visual signal that indicates to the user that a fire or other potentially harmful event has been detected in cooking chamber **104**. By way of example, the warning may be a notification displayed on user interface **128**, an LED light, a buzzer, and/or any other appropriate visual and/or audible signal.

At step **210**, door lock **160** of oven door **108** is engaged to lock the oven door. Locking door **108** prevents the user from accessing cooking chamber **104** and being injured by, e.g., flames or smoke. At step **212**, damper **158** is operated to close vent **156**. Closing vent **156** reduces the oxygen available to fuel a fire within cooking chamber **104**, which could help extinguish a fire within cooking chamber **104**. Closing vent **156** may also help contain any smoke within cooking chamber **104**. Similarly, convection fan **142** could be deactivated to diminish air movement within cooking chamber **104**. Further, at step **214** of method **200**, heating elements **124**, **126** are disconnected from energy source **162** to prevent the addition of heat to cooking chamber **104** through heating elements **124**, **126**.

Method **200** also includes step **216** of alerting emergency services to a possible fire. In certain embodiments, controller **154** may alert emergency services to a possible fire in oven appliance **100** through the wireless or wired communication connection described above. In alternative embodiments, step **216** may include providing an audible and/or visible instruction to a user, e.g., through user interface **128**, to alert emergency services.

As described above, in alternative embodiments, oven appliance **100** may include more than one vent and damper, and each vent may be closed by a damper at step **212**. Additionally, oven appliance **100** may include a convection heating element that also is disconnected from its energy source at step **214**. Other configurations of oven appliance **100** may also be used, and method **200** may include steps to contain a fire and/or smoke within oven appliance **100**, or to protect a user of the oven appliance, based on other configurations of oven appliance **100**.

FIG. **6** illustrates another exemplary method **300** for operating oven appliance **100**. The exemplary method includes step **302** of monitoring the temperature T in cooking chamber **104** and measuring the current gas level. At step **304**, the temperature T is compared to a threshold temperature T_{thr}. If

the temperature T has not reached at least the threshold temperature T_{thr}, the method proceeds to step **306**, where the current gas level is compared to the baseline gas level. If the current gas level has not reached at least the baseline gas level, the method returns to step **302**. However, if at step **304** the temperature T within cooking chamber **104** has reached at least the threshold temperature T_{thr}, or if at step **306** the current gas level has reached at least the baseline gas level, the method proceeds to step **308**, implementing measures to contain and/or extinguish the fire and protect the user of the oven appliance. Also, it is noted the order of steps **304** and **306** can be changed or even operated simultaneously.

At step **308**, a warning is provided to a user of oven appliance **100** that there is a fire or other potentially harmful event, such as, e.g., very high temperatures or smoke, in cooking chamber **104**. As described, the warning may be any audible and/or visual signal, such as a notification displayed on user interface **128**, an LED light, and/or a buzzer, that indicates to the user that a fire or other potentially harmful event has been detected in cooking chamber **104**. At step **310**, door lock **160** of oven door **108** is engaged to lock the oven door and prevent the user from accessing cooking chamber **104**. At step **312**, damper **158** is operated to close vent **156**. As described, convection fan **142** also could be deactivated to diminish air movement within cooking chamber **104**. Further, at step **314**, heating elements **124**, **126** are disconnected from energy source **162** to prevent the addition of heat to cooking chamber **104** through heating elements **124**, **126**. At step **316**, emergency services are alerted to a possible fire through, e.g., the wireless or wired communication connection of oven appliance **100**, or an audible and/or visible instruction is provided to a user, e.g., through user interface **128**, to alert emergency services.

As described above, in alternative embodiments, oven appliance **100** may include more than one vent and damper, and each vent may be closed by a damper at step **312**. Additionally, oven appliance **100** may include a convection heating element that also is disconnected from its energy source at step **314**. Other configurations of oven appliance **100** may also be used, and method **300** may include steps to contain a fire and/or smoke within oven appliance **100**, or to protect a user of the oven appliance, based on other configurations of oven appliance **100**. For example, a combination of the embodiments of FIGS. **5** and **6** may be used that includes both T_{thr} and ΔT_{ref}.

This written description uses examples to disclose the invention, including the best mode, and also to enable any person skilled in the art to practice the invention, including making and using any devices or systems and performing any incorporated methods. The patentable scope of the invention is defined by the claims and may include other examples that occur to those skilled in the art. Such other examples are intended to be within the scope of the claims if they include structural elements that do not differ from the literal language of the claims or if they include equivalent structural elements with insubstantial differences from the literal language of the claims.

What is claimed is:

1. An oven appliance, comprising:

a cabinet defining an opening at a front portion of the cabinet, the cabinet also defining a cooking chamber configured for receipt of food items for cooking, the cooking chamber comprising a top wall, a bottom wall, a back wall, and opposing side walls;

a door mounted to the cabinet at the opening of the cabinet, the door being selectively adjustable between an open position and a closed position to permit selective access to the cooking chamber through the opening of the cabinet;

a heating element configured to heat the cooking chamber, the heating element having an energy source;

a vent defined in one of the top wall, bottom wall, back wall, or opposing side walls of the cooking chamber for exhausting fumes and gases generated during cooking from the cooking chamber;

a temperature sensor; and

a controller, the controller configured for

measuring a temperature T within the cooking chamber;

monitoring a rate of temperature change ΔT within the cooking chamber;

identifying whether the temperature T has reached at least a threshold temperature T_{thr};

comparing the rate of temperature change ΔT within the cooking chamber to a reference rate of temperature change ΔT_{ref};

providing a warning to a user of the oven appliance if the rate of temperature change ΔT has reached at least the reference rate of temperature change ΔT_{ref}; and

implementing measures to protect the user of the oven appliance if the controller determines there is a fire within the cooking chamber.

2. The oven appliance of claim **1**, further comprising a gas sensor positioned within the cooking chamber, wherein the controller is further configured for

measuring a current gas level;

identifying whether the current gas level has reached at least a baseline gas level to determine if there is a fire in the cooking chamber;

providing the warning to the user of the oven appliance if the current gas level has reached at least the baseline gas level; and

implementing pleasures to protect the user of the oven appliance if the controller determines there is a fire within the cooking chamber.

3. The oven appliance of claim **1**, further comprising a gas sensor positioned outside the cooking chamber, wherein the controller is further configured for

measuring a current gas level;

identifying whether the current gas level has reached at least a baseline gas level to determine if there is a fire in the cooking chamber;

providing the warning to the user of the oven appliance if the current gas level has reached at least the baseline gas level; and

implementing measures to protect the user of the oven appliance if the controller determines there is a fire within the cooking chamber.

4. The oven appliance of claim **1**, further comprising a damper for closing the vent, wherein the controller is further configured for activating the damper to close the vent to protect the user of the oven appliance.

5. The oven appliance of claim **1**, further comprising a user interface, wherein the controller is further configured for providing the warning by displaying a visual warning on the user interface.

6. The oven appliance of claim **1**, further comprising a door lock, wherein the controller is further configured for engaging the door lock to protect the user of the oven appliance.

7. The oven appliance of claim **1**, wherein the controller is further configured for disconnecting the heating element from the energy source to protect the user of the oven appliance.

8. An oven appliance, comprising:

a cabinet defining an opening at a front portion of the cabinet, the cabinet also defining a cooking chamber configured for receipt of food items for cooking, the cooking chamber comprising a top wall, a bottom wall, a back wall, and opposing side walls;

a door mounted to the cabinet at the opening of the cabinet, the door being selectively adjustable between an open position and a closed position to permit selective access to the cooking chamber through the opening of the cabinet;

a heating element configured to heat the cooking chamber, the heating element having an energy source;

a vent defined in one of the top wall, bottom wall, back wall, or opposing side walls of the cooking chamber for exhausting fumes and gases generated during cooking from the cooking chamber;

a gas sensor; and

a controller, the controller configured for

measuring a current gas level;

measuring a rate of temperature change ΔT within the cooking chamber;

comparing the current gas level to a baseline gas level;

identifying whether the current gas level has reached at least the baseline gas level to determine if there is a fire in the cooking chamber;

identifying whether a rate of temperature change ΔT has reached at least a reference rate of temperature change ΔT_{ref};

providing a warning to a user of the oven appliance if the current gas level has reached at least the reference gas level; and

implementing measures to protect the user of the oven appliance if the controller determines there is a fire within the cooking chamber.

9. The oven appliance of claim 8, further comprising a damper for closing the vent, wherein the controller is further configured for activating the damper to close the vent to protect the user of the oven appliance.

10. The oven appliance of claim 8, further comprising a user interface, wherein the controller is further configured for providing the warning by displaying the warning on the user interface.

11. The oven appliance of claim 8, further comprising a door lock, wherein the controller is further configured for engaging the door lock to protect the user of the oven appliance.

12. The oven appliance of claim 8, wherein the controller is further configured for disconnecting the heating element from the energy source to protect the user of the oven appliance.

13. The oven appliance of claim 8, wherein the gas sensor is positioned outside the cooking chamber.

14. A method for operating an oven appliance, the method comprising:

monitoring a temperature T within a cooking chamber of the oven appliance;

measuring a rate of temperature change ΔT within the cooking chamber;

comparing the temperature T within the cooking chamber to a threshold temperature T_{thr} and identifying whether a rate of temperature change ΔT has reached at least a reference rate of temperature change ΔT_{ref} to determine if there is a fire in the cooking chamber;

providing a warning to a user of the oven appliance if the temperature T is at least equal to the threshold temperature T_{thr} and the rate of temperature change ΔT has reached at least the reference rate of temperature change ΔT_{ref}; and

implementing measures to protect the user of the oven appliance if the controller determines there is a fire within the cooking chamber, wherein implementing measures to protect the user of the oven appliance comprises

activating a damper of the oven appliance to close a vent for exhausting fumes and gases generated during cooking from a cooking chamber of the oven appliance;

engaging a door lock of the oven appliance to prevent a user from opening a door of the oven appliance; and

disconnecting a heating element of the oven appliance from an enemy source.

15. The method of claim 14, wherein providing the warning to the user comprises displaying the warning on a user interface of the oven appliance.

16. The method of claim 14, further comprising:

measuring a current gas level;

identifying whether the current gas level has reached at least a baseline gas level to determine if there is a fire in the cooking chamber;

providing the warning to the user of the oven appliance if the current gas level has reached at least the baseline gas level; and

implementing measures to protect the user of the oven appliance if the controller determined there is a fire within the cooking chamber.

17. The oven appliance of claim 1, wherein the warning provided to the user of the oven appliance indicates to the user that a fire has been detected in the cooking chamber.

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UNITED STATES PATENT AND TRADEMARK OFFICE

CERTIFICATE OF CORRECTION

PATENT NO. : 9,418,528 B2
APPLICATION NO. : 14/310121
DATED : August 16, 2016
INVENTOR(S) : Andrea Nichole Stokes

It is certified that error appears in the above-identified patent and that said Letters Patent is hereby corrected as shown below:

In the Claims

In Line 37 of Column 8, “pleasures” should be “measures”
In Line 31 of Column 10, “enemy” should be “energy”
In Line 45 of Column 10, “determined” should be “determines”

Signed and Sealed this
Fifth Day of June, 2018

Andrei Iancu
Director of the United States Patent and Trademark Office